



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

MEMORANDUM

SUBJECT: Five-Year Review for the TRW Microwave Superfund Site, Sunnyvale, CA

FROM: Tom Kremer, Superfund Policy Advisor
Site Cleanup Branch

A handwritten signature in black ink, appearing to read "Tom Kremer".

THRU: John Kemmerer, Chief
Site Cleanup Branch

A handwritten signature in black ink, appearing to read "John Kemmerer".

TO: Keith Takata, Director
Superfund Division

I. INTRODUCTION

Attached, please find a copy of the first Five-Year Review for the subject Superfund Site prepared by the California Regional Water Quality Control Board, San Francisco Bay Region. EPA has reviewed their Five-Year Review and adopts their recommendations as written. The Board's Five-Year Review is summarized below.

Because contaminant levels will allow for unlimited use and unrestricted exposure upon achieving ROD cleanup goals, this Five-Year Review is not required by CERCLA (Section 121©) or by Section 300.430(f)(4)(ii) of the NCP. However, because cleanup will take five years or more to attain, this Five-Year Review must be conducted as a matter of Agency policy (OSWER Directive 9355.7-02, "Structure and Components of Five-Year Reviews", 5/31/91. This review (Type 1) is applicable to sites at which construction is complete (OSWER Directive 9355.7-02A, "Supplemental Five-Year Review Guidance", 7/26/94.

II. FIVE-YEAR REVIEW SUMMARY

The TRW Microwave site is located at 825 Stewart Drive in Sunnyvale. Ground water contamination from this site has commingled with contamination from the Signetics (aka Philips Semiconductors) and the Advanced Micro Devices Superfund sites. EPA proposed listing the site on the National Priority List in 1988 and finalized the listing in 1990.

The ROD set soil and groundwater cleanup standards for the site, required operation of a soil vapor extraction system, and required on- and off-site ground water extraction and treatment.

TRW has implemented the required remedial actions, operating on- and off- site ground water extraction and treatment and on-site soil vapor extraction systems. SVE systems at have been effective in removing VOCs from the unsaturated zone, and have been shut down. TRW

will evaluate in 2000 whether to resume SVE to enhance ground water cleanup. Ground water systems have been effective in containing the plume and reducing concentrations of contaminants in ground water, and continue to operate. TRW is currently evaluating alternative technologies to reduce high VOC levels remaining in ground water on site. The site was last inspected by Regional Board staff on 8/25/98. Institutional controls have been in place since 1993. No exposure to contaminated groundwater is occurring or expected. Full achievement of cleanup standards remains years away.

III CONCLUSION

I certify that the remedy selected for this site remains protective of human health and the environment. Based on the expected continuing presence of contamination at this site at levels which preclude unlimited use and unrestricted exposure, the next Five-Year Review will be written by 9/17/2003.

Approved by: Keith Takata
Keith Takata, Director
Supertund Division

Date: 9-29-99

Attachment: California Regional Water Quality Control Board 5-Year Review

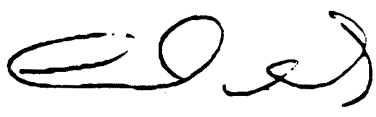
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

INTERNAL MEMO

TO: Loretta K. Barsamian
Executive Officer

Date: November 7, 1996

FROM: Cecilio Felix
Assoc. Engineering Geologist

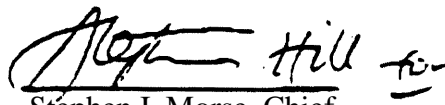
Signature: 

SUBJECT: Review Comments on Five-Year Status Reports and Effectiveness Evaluations for Philips Semiconductors (811 East Arques Avenue), TRW Microwave (825 Stewart Drive), Advanced Micro Devices (901-902 Thompson Place and 915 DeGuine Drive), Sunnyvale, Santa Clara County

CONCUR:


Stephen A. Hill

Section Leader



Stephen I. Morse, Chief
Toxics Cleanup Division

The above dischargers have submitted their first Five-Year Status Report and Effectiveness Evaluations for their respective sites. The sites have been used to manufacture semiconductor components, circuit boards, and microwave tubes. Groundwater contamination was detected at the sites in the early 1980s; investigation and interim remediation was initiated in the early to mid 1980s. Final Cleanup Plans adopted for the sites in June 1991 and have been implemented. Based on the data provided in the five year status reports, VOC concentrations are being reduced and VOC migration is being controlled in general. However, as with other similar sites, it is uncertain whether the groundwater cleanup goals can be achieved within a reasonable time. The dischargers may propose alternative cleanup goals in the future.

The two most significant issues concern the Philips Operable Unit (OU) and the downgradient Off-Site OU. The recently discovered migration pathway on the Philips OU has the potential to allow significant concentrations of VOCs to impact areas further downgradient in the Off-Site OU. In the Off-Site OU VOC contamination was recently detected at the northernmost extent of the pollution plume. Philips proposes to conduct additional investigation to determine the appropriate modifications to the groundwater cleanup in their on-site OU and the southern portion of the Off-Site OU. Philips, AMD, and TRW need to consider alternatives to control VOC migration at the downgradient portion of the Off-Site OU.

I recommend that the five year review reports be accepted by the Board. The attachments provide an overview of each five year report. I further recommend that Philips be required to conduct the additional investigation necessary to further characterize VOC migration pathways at the Philips OU and the southern portion of the Off-Site OU, and modify the groundwater remediation as appropriate. I also recommend that Philips, TRW, and AMD be required to evaluate and implement remedial measures necessary to address groundwater contamination at the northern portion of the Off-Site Operable Unit.

Attachments

**U.S. Environmental Protection Agency
Region IX
Hazardous Waste Division
Five-Year Review (Type I)
TRW Microwave
(formerly FEI Microwave)
Sunnyvale, California**

I. Introduction

Authority Statement and Purpose. EPA Region IX conducted this review pursuant to CERCLA section 121(c), NCP section 300.400(f)(4)(ii), and OSWER Directives 9355.7-02 (May 23, 1991) and 9355.7-02 (July 26, 1994). It is a policy review. The purpose of a five-year review is to ensure that a remedial action remains protective of public health and the environment and is functioning as designed. This document will become a part of the Site File. This review (Type I) is applicable to a site at which response is ongoing.

Site Characteristics. TRW is a federal Superfund site in the South Bay, overseen by the Board under an agreement with the U.S. EPA. In accordance with its 1991 site cleanup requirements, TRW has evaluated the remedial activities performed at the site to determine if the selected cleanup plans are working. The results were submitted in a report titled "Five-Year Status Report and Effectiveness Evaluation", dated July 19, 1996.

The TRW site is located at 825 Stewart Drive, south of Highway 101 in Sunnyvale. The site is located among a number of other Superfund sites, including the Advanced Micro Devices site, located at 901-902 Stewart Drive (AMD 901-902), and the Philips Semiconductors (Philips) site, located at 440 N. Wolfe Road and 811 E. Arques Avenue. The three Superfund sites are referred to as Operable Units (OUs); TRW, AMD, and Philips are responsible for addressing groundwater contamination within their respective OUs. Commingled groundwater contamination originating from the TRW, AMD 901-902, and Philips sites has migrated northward, beyond the sites' boundaries. The off-site impacted area has been designated as the Off-Site Operable Unit. TRW, AMD, and Philips (collectively referred to as The Companies) are jointly responsible for addressing groundwater contamination in the Off-Site OU.

A fourth Superfund site, the AMD facility at 915 DeGuine Drive (AMD 915), is located adjacent to the TRW, AMD 901-902, and Philips sites. Groundwater contamination originating at the AMD site is limited to the area of the AMD 915 facility. AMD is the discharger responsible for addressing groundwater contamination at the AMD 915 Operable Unit.

Investigations were initiated at the TRW Operable Unit in July 1983. The investigations indicated that both soil and groundwater were impacted with VOCs; the source of contamination was an underground storage tank. The tank was removed, and approximately 120 cubic yards of the surrounding soil were excavated. Although no additional soil remediation was required, a soil vapor extraction (SVE) system was installed to reduce any residual soil contamination and to enhance the effectiveness of the groundwater extraction system.

VOCs in the groundwater beneath the TRW site are limited to the upper aquifers, and have not impacted deeper aquifers used for public water supply. In 1984, after the storage tank was removed from the site, the excavation was backfilled and converted into a groundwater extraction pit. In 1985, TRW began extracting groundwater from seven wells in the TRW Operable Unit. Extracted groundwater is treated and discharged to the surface water under NPDES permit.

In the Off-Site OU, commingled VOC groundwater contamination from the TRW, AMD 901-902, and Philips sites is captured by 29 extraction wells in the A, B1, B2, B3, and B4 aquifers. Groundwater extraction in the Off-Site OU began in 1986 and was expanded in 1988 and 1992. The extraction wells are generally arranged in east-west lines along Duane Avenue, Carmel Avenue, Alvarado Avenue, and Highway 101. Groundwater from the Off-Site OU is discharged to surface waters under NPDES permit.

Since the Final Site Cleanup Requirements were adopted in 1991, additional investigations were conducted in the Off-Site OU in order to further define the northern extent of groundwater contamination. The new data indicate that significant levels of contamination exist approximately 1200 feet beyond the northernmost groundwater extraction wells in one water bearing zone. It is unlikely that the groundwater contamination in the recently investigated northern area is being captured by the existing groundwater cleanup program.

II. Discussion of Remedial Objectives. The remedial plan was developed using the nine evaluation criteria defined by CERCLA requirements and considerations. The selected remedy was groundwater extraction and treatment. This is the most cost effective technology available and is protective of human health and the environment. The soil cleanup standard is 1 ppm for vadose zone soil. Groundwater cleanup standards are based on USEPA MCLs.

III. ARARs Review. ARARs have not changed for the chemicals of concern.

IV. Effectiveness Evaluation. TRW has spent approximately \$600,000 over the last five years on remediation and monitoring in this Operable Unit. The SVE system has removed at total of approximately 116 pounds of TCE in the TRW OU. TRW estimates that soil remedial measures have reduced VOC mass in soil near the source area by approximately 85%. TRW is currently evaluating additional enhancements to the SVE system to accelerate

cleanup of soils in the vadose zone and saturated zone.

The groundwater extraction system appears to have established hydraulic control of the most highly impacted groundwater at the TRW OU, and generally, VOC concentrations have been reduced. However, it is unlikely that groundwater cleanup standards will be achieved within the 7 year period during which groundwater remediation is to be maintained, as specified in the 1991 SCR. TRW is currently evaluating modifications to accelerate cleanup of groundwater contamination at the site. TRW is proposing to reduce extraction in the B-aquifer, as groundwater extraction at the adjacent Philips may be sufficient to remediate the B-aquifer on the TRW site. Board staff are considering this proposal but would only approve it as part of a coordinated cleanup plan.

Although hydraulic control of the plume has been established for a significant portion of the Off-Site OU and VOC concentrations have been reduced, it is uncertain whether groundwater cleanup will be achieved within the 36 year period specified in the 1991 SCR in which remediation in the Off-Site OU is to be maintained. In addition, additional evaluation is necessary to determine the most appropriate method of controlling and remediating groundwater VOC contamination in the northern area of the Off-Site OU after the 1991 SCRs were adopted. It is possible that additional groundwater extraction wells will be necessary in the northern area of the Off-Site OU.

A summary of their performance from 1991-1995 is summarized in Table. Summaries are also included for the adjacent Superfund sites. The effectiveness of groundwater extraction largely depends on the permeability of the soil matrix, the quantity of VOCs sorbed to the soil matrix, and the rate of VOC transfer from soil matrix to groundwater. The slowly decreasing mass removal rate and the relatively stable VOC plume configuration and concentrations despite extraction of significant volumes of groundwater indicate that large quantities of VOCs may be bound to soil matrix and may have diffused into low permeability soil matrix which contains relatively immobile groundwater. The rate of VOC transport from low permeability media is an extremely slow process. Therefore, while the groundwater extraction system has provided source control and some reduction in chemical concentrations, groundwater extraction has not resulted in any significant retraction of the overall extent of the plume.

Extraction efficiency is averaged over the 1991-1995 year period. Generally there has been a decline in removal efficiencies as cleanup progresses; the exception is the Philips Operable

Unit. Since cleanup began at the sites in the early to mid 1980s, the total volume of groundwater extracted is 1609 million gallons, and the total mass of VOCs is approximately 36,544 pounds.

Table 1 - Groundwater Extraction Summary for 1991-1995 Period

Operable Unit	Volume of Extracted Groundwater (million gallons)	VOC Mass Removal (lbs)	Average Efficiency (lbs/m.gal)
Philips	229	10850	47
TRW	39	942	24
AMD 901-902	66	189	3
AMD 915	160	845	5
Off-Site	316	2151	7
Total	810	14997	average: 17

V. Summary of Site Visit Regional Board staff inspected the site most recently in July 1994. The remediation systems were operating properly. At the time, TRW was in the process of expanding the SVE system.

VI. Areas of Noncompliance The discharger has fully implemented the approved remedial action, consistent with the remedial objectives, and is in compliance. However, the discharger needs to consider additional remedial actions in response to recent investigation results in the Off-Site OU.

VII. Recommendations At this time, the discharger should continue implementation of the approved remedial actions. At present, no remedial technologies have been identified that would significantly improve the effectiveness of the implemented remedies. However, modifications to the Final Cleanup Plan should be made as appropriate following evaluation of options to address the groundwater contamination at the northern portion of the Off-Site OU.

VIII. Statement of Protectiveness

I certify that the remedy selected for this site remains protective of human health and the environment.

IX. Next Five-Year Review

The next five-year review will be conducted by June 19, 2001.

Keith Takata, Director
Hazardous Waste Management Division, Region IX